**R and Jags script for editor and reviewers.**

library(jagsUI)

sink("./BUGS/ZIP\_FSJ.txt")

cat("

model {

# Priors

Habitat[1] <- 0

Habitat[2] ~ dnorm(0, 0.01)

Habitat[3] ~ dnorm(0, 0.01)

Habitat.succ.p[1] <- 0

Habitat.succ.p[2] ~ dnorm(0, 0.01)

Habitat.succ.p[3] ~ dnorm(0, 0.01)

intercept ~ dnorm(0, 0.01)

beta.help ~ dnorm(0, 0.01)

beta.F.exp ~ dnorm(0, 0.01)

beta.M.exp ~ dnorm(0, 0.01)

beta.T.area ~ dnorm(0, 0.01)

beta.density ~ dnorm(0, 0.01)

beta.rain.count ~ dnorm(0, 0.01)

beta.prop.strong ~ dnorm(0, 0.01)

beta.supp.food ~ dnorm(0, 0.01)

succ.p.ls ~ dnorm(0, 0.01)

beta.help.succ.p ~ dnorm(0, 0.01)

beta.F.exp.succ.p ~ dnorm(0, 0.01)

beta.M.exp.succ.p ~ dnorm(0, 0.01)

beta.T.area.succ.p ~ dnorm(0, 0.01)

beta.density.succ.p ~ dnorm(0, 0.01)

beta.rain.succ.p ~ dnorm(0, 0.01)

# hyperpriors

for(j in 1:n.pop){

Pop.RE[j] ~ dnorm(0, tau.pop.re) # prior for effect of group j

Pop.succ.p.RE[j] ~ dnorm(0, tau.pop.succ.p.re) # prior for effect of group j

}

sigma.pop.re ~ dnorm(0, 0.2)I(0,) # hyperprior for RE sd

tau.pop.re <- 1 / (sigma.pop.re \* sigma.pop.re)

sigma.pop.succ.p.re ~ dnorm(0, 0.2)I(0,) # hyperprior for RE sd

tau.pop.succ.p.re <- 1 / (sigma.pop.succ.p.re \* sigma.pop.re)

for(k in 1:n.year){

Year.RE[k] ~ dnorm(0, tau.year.re) # prior for effect of group j

Year.succ.p.RE[k] ~ dnorm(0, tau.year.succ.p.re) # prior for effect of group j

}

sigma.year.re ~ dnorm(0, 0.2)I(0,) # hyperprior for RE sd

tau.year.re <- 1 / (sigma.year.re \* sigma.year.re)

sigma.year.succ.p.re ~ dnorm(0, 0.2)I(0,) # hyperprior for RE sd

tau.year.succ.p.re <- 1 / (sigma.year.succ.p.re \* sigma.year.succ.p.re)

for(l in 1:n.terr){

terr.RE[l] ~ dnorm(0, tau.terr.re) # prior for effect of group j

terr.succ.p.RE[l] ~ dnorm(0, tau.terr.succ.p.re) # prior for effect of group j

}

sigma.terr.re ~ dnorm(0, 0.5)I(0,) # hyperprior for RE sd

tau.terr.re <- 1 / (sigma.terr.re \* sigma.terr.re)

sigma.terr.succ.p.re ~ dnorm(0, 0.5)I(0,) # hyperprior for RE sd

tau.terr.succ.p.re <- 1 / (sigma.terr.succ.p.re \* sigma.terr.re)

# Likelihood

for (i in 1:n.data) {

s[i] ~ dbern(succ.p[i])

y[i] ~ dpois(mean[i]\*s[i])

log(mean[i]) <- intercept + Habitat[hab[i]] + beta.help\*helpers.bin[i] +

beta.T.area\*T.area[i] + beta.density\*density[i] + beta.rain.count\*rain[i] +

beta.prop.strong\*prop.strong[i] + beta.supp.food\*supp.food[i] +

Pop.RE[Pop.num[i]] + Year.RE[Year[i]] + terr.RE[ID.rep[i]]

logit(succ.p[i]) <- succ.p.ls + Habitat.succ.p[hab[i]] + beta.help.succ.p\*helpers.bin[i] +

beta.T.area.succ.p\*T.area[i] + beta.M.exp.succ.p\*M.exp[i] +

beta.F.exp.succ.p\*F.exp[i] + beta.density.succ.p\*density[i] + beta.rain.succ.p\*rain[i] +

Year.succ.p.RE[Year[i]]

# generate new obs for posterior predictive check

s.new[i] ~ dbern(succ.p[i])

y.new[i] ~ dpois(mean[i]\*s.new[i])

TF.stat[i] <- pow(sqrt(y[i]) - sqrt(mean[i]\*s[i]),2)

TF.stat.new[i] <- pow(sqrt(y.new[i]) - sqrt(mean[i]\*s.new[i]),2)

}

fit.actual <- sum(TF.stat)

fit.new <- sum(TF.stat.new)

bpv <- step(fit.actual-fit.new)

}

",fill=TRUE)

sink()

load(file="./RData/FSJ data for paper.RData")

win.data.re <- list(n.data=nrow(juve.3),

y=juve.3$JJ,

hab=as.numeric(juve.3$habitat),

helpers = scale(juve.3$tot.help, scale = 2\*sd(juve.3$tot.help))[,1],

helpers.bin = as.numeric(juve.3$tot.help>0),

helpers.2 = scale(juve.3$tot.help, scale = 2\*sd(juve.3$tot.help))[,1]^2,

n.pop=length(unique(juve.3$POP)),

Pop.num = juve.3$Pop.num,

n.year=length(unique(juve.3$YR)),

Year=juve.3$Year.num,

n.terr=length(unique(juve.3$ID.rep)),

ID.rep=as.numeric(juve.3$ID.rep),

F.exp =scale(ifelse(is.na(juve.3$FBB\_MEXP),0,juve.3$FBB\_MEXP), scale = 2\*sd(ifelse(is.na(juve.3$FBB\_MEXP),0,juve.3$FBB\_MEXP)))[,1],

M.exp =scale(ifelse(is.na(juve.3$MBB\_MEXP),0,juve.3$MBB\_MEXP), scale = 2\*sd(ifelse(is.na(juve.3$MBB\_MEXP),0,juve.3$MBB\_MEXP)))[,1],

T.area=scale(juve.3$TAREA, scale = 2\*sd(juve.3$TAREA))[,1],

density=scale(juve.3$density, scale = 2\*sd(juve.3$density))[,1],

rain=scale(juve.3$ppc, scale = 2\*sd(juve.3$ppc))[,1],

supp.food=as.numeric(juve.3$supp.food),

prop.strong=scale(juve.3$prop.strong, scale = 2\*sd(juve.3$prop.strong))[,1],

B=5

)

inits.re <- function(){list(beta.help = rnorm(1,0, 10), intercept= rnorm(1,0, 1),

s=rep(1,length(juve.3$JJ)),sigma.terr.re = runif(1,0,0.5),

sigma.year.re = runif(1,0,0.5))}

# Params to estimate

parameters <- c("intercept", "Habitat", "beta.help", "beta.T.area", "beta.rain.count",

"beta.prop.strong", "beta.supp.food", "beta.density",

"succ.p.ls", "succ.prob.sink", "succ.prob.weak", "succ.prob.strong",

"Habitat.succ.p", "beta.help.succ.p", "beta.density.succ.p",

"beta.M.exp.succ.p", "beta.F.exp.succ.p", "beta.T.area.succ.p", "beta.rain.succ.p",

"sigma.year.re", "sigma.terr.re", "sigma.pop.re",

"sigma.year.succ.p.re","bpv")

# MCMC settings

ni <- 2000

nb <- 500

nt <- 1

nc <- 3

FSJ\_zip.jags <- jags(win.data.re, inits.re, parameters, "BUGS/ZIP\_FSJ.txt",

n.thin=nt, n.chains=nc, n.burnin=nb, n.iter=ni, parallel = 3)

print(FSJ\_zip.jags, digits=3)